

11. Module XI: Structure and Functional Microbiology

11.1. Module Objectives

On completion of this module, the students will be able to:

- implement microbial techniques to study cellular functions of microorganisms
- implement molecular techniques to study structural functions of microorganisms
- analyze and interpret physiological processes within cells
- breakdown problems within the field of microbial physiology by using a mathematical approach
- communicate the basic concept and utilize literature to interpret and evaluate it
- identify the structure and function of cells from a cellular level to a molecular level
- work and communicate in a team
- describe metabolism and factors affecting it

11.2. Module Data

Person in charge	Intan Taufik M.Si.
Total Credits	9
Course	BM2201 Cell and Molecular Biology
	BM2202 Microbial Quantitative Physiology
	BM2204 Projects in Microbial Physiology
Module Examination	Written test

11.2.1. Sub-module I: Cell and Molecular Biology

Lecturer	Dr. Ernawati G. Rahman
Semester	4
Type of submodule / course	Lecture with exercise and laboratory work
Credits	4 (1)
Workload	3 hours lectures, 3 hours laboratory, 3 hours structured activities, 3 hours individual study, 16 weeks per semester, and total 192 hours a semester
Workload details	Textbook reading assignment, group discussion, laboratory practice
Classification within the curriculum:	General Studies / Compulsory Course/ Elective Course
Type of assessment/examination	Written Test : Midterm exam, Final exam, Quizess, Assignments Presentation Lab skill test: hands on
Language	Bahasa Indonesia

Course Target / Outcome	<ol style="list-style-type: none"> 1. Students be able to identify cell structure and fuction, macromolecules within Eukaryotic cells, and are able to distinguish the difference between Procaryotes and Eukaryotes 2. Students will be able to implement molecular techniques to study structural fuctions of microorganisms 3. Students will be be able to identify the structure and function of cells from a cellular level to a molecular level 4. Students will be able to work and communicate in a team
Teaching methods	Interactive Teaching and Interactive Laboratory Practices
Contents (SAP)	
	1 Introduction
	2 Structure and Dynamics of Cells
	3 Eukaryotic Cell Cycle and Tissue Formation
	4 Structure and Function of Eukaryotic Cell Membrane
	5 Interaction between Eukaryotic Cell and the Environment
	6 Endomembrane and Membrane Trafficking
	7 Cytoskeleton I: concept of cytoskeleton, homology with like-cytoskeleton in prokaryotic
	8 Cytoskeleton II : cytoskeleton modification related to infectious disease
	9 Mid-Term Test
	10 Gene and Genome
	11 Gene Expression I: differences between transcription and translation system in prokaryotic and eukaryotic
	12 Gene Expression II : control of gene expression in prokaryotic and eukaryotic
	13 Contol of Gene Expression
	14 Replication dan DNA Repair
	15 Signal Transduction
	16 Final Test
Literature / Sources	<p>- Karp, G. <i>Cell and Molecular Biology: Concepts and Experiments</i>. 7th Ed. John Wiley and Sons, Inc. 2013.</p> <p>- Alberts, B., Bray, D.,Hopkin,K, Johnson,A., Lewis, J., Raff, M., Roberts, K. and Walter, P. <i>Essential Cell Biology</i>, 3rd ed. Garland Science, 2009.</p> <p>-Scientific journal and Article Review</p>
Other specialties	

11.2.2. Sub-module II: Microbial Quantitative Physiology

Lecturer	Dr. Pingkan Aditiawati Intan Taufik, M.Si.
Semester	4
Type of submodule / course	Lecture with exercise
Credits	3
Workload	3 hours lectures, 3 hours structured activities, 3 hours individual study, 16 weeks per semester, and total 144 hours a semester
Workload details	Textbook reading assignment, group discussion
Classification within the curriculum:	General Studies / Compulsory Course/ Elective Course
Type of assessment/examination	Written Test : Midterm exam, Final exam, Quizzes, Assignments
Language	Bahasa Indonesia
Course Target / Outcome	<ol style="list-style-type: none"> 1. Students will be able to analyze and interpret physiological processes within cells 2. Students will be able to quantitatively interpret physiological processes of microorganisms 3. Students will be able to describe metabolism and factors affecting it
Teaching methods	Interactive Teaching
Contents (SAP)	
1	Composition and organization of cell structure and function
2	Structure and function of cellular parts
3	Macromolecular synthesis - assembly and polymerization of bacterial interior and envelope
4	Biosynthesis and Fueling
5	Central Metabolism and Energy Conservation
6	Growth and Cell Division (Quest for food, growth of cells and population, cell cycle)
7	Mid-Term Test
8	Bacterial Genetics and Regulation : Genome and its plasticity
9	Bacterial Genetics and Regulation : Genetic Exchange and recombination
10	Metabolic/Pathway regulation : Coordination of Metabolic Reaction
11	Metabolic/Pathway regulation : Operons (regulation of gene expression)

	12	Metabolic/Pathway regulation : Multigene system and global regulation
	13	Growth rate as a variable
	14	Bacterial Differentiation
	15	Bofilm - Physiological ecology
	16	Final Test
Literature / Sources		- Griffin, D. H. 1994. Fungal Physiology. 2nd ed. Wiley Liss Inc, NY. - Moat. A.G. dan J.W. Foster 2006. Microbial Physiology 4th ed. John Wiley and Sons, NY. - Neidhardt, FC, J. L. Ingraham, M. S. Schalchter. 1990 Physiology of the bacterial cell. Sinaver. Associates, Inc. USA
Other specialties		-

11.2.3. Sub-module III: Projects in Microbial Physiology

Lecturer	Dr. Ernawati G. Rahman Dr. Isty A. Purwasena Intan Taufik, M.Si.
Semester	4
Type of submodule / course	Laboratory work
Credits	2
Workload	6 hours laboratory, 2 hours structured activities, 2 hours individual study, 16 weeks per semester, and total 160 hours a semester
Workload details	Textbook assignment, laboratory practice, group discussion, presentation
Classification within the curriculum:	General Studies / Compulsory Course/ Elective Course
Type of assessment/examination	Written Test : Midterm exam, Final exam, Assignments Presentation
Language	Bahasa Indonesia
Course Target / Outcome	1. Students will be able to implement microbial techniques to study cellular functions of microorganisms 2. Students will be able to breakdown problems within the field of microbial physiology by using a mathematical approach 3. Students will be able to work and communicate in a

	team
Teaching methods	Interactive Laboratory Practices
Contents (SAP)	
1	Introduction
2	Microbial cell structure (protoplast and spheroplast isolation)
3	Isolation of tryptophan consuming bacteria
4	Bacterial growth response in biotin supplementation media
5	Sulfanilamide function for bacterial growth
6	Mid term test
7	Response to environmental stress
8	Oral microbiota
9	Mini Project 1
10	Plasmid curing
11	Biofilm formation
12	Mini Project II
13	Final presentation project I
14	Final presentation II
15	Final presentation III
Literature / Sources	<ul style="list-style-type: none"> - Griffin, D. H. 1994. Fungal Physiology. 2nd ed. Wiley Liss Inc, NY. - Moat. A.G. dan J.W. Foster 2006. Microbial Physiology 4th ed. John Wiley and Sons, NY. - Neidhardt, FC, J. L. Ingraham, M. S. Schalchter. 1990 Physiology of the bacterial cell. Sinauer. Associates, Inc. USA
Other specialties	-